CONSERVATION IN BISCAYNE BAY

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November, 1965

[Restored and transferred to electronic form by A. Cantillo (NOAA) in 1999. Original stored at the Library, Rosenstiel School of Marine and Atmospheric Science, University of Miami. Minor editorial changes were made.]

The conservation of Biscayne Bay is a project of vital importance to the people of Dade County since if we fail to apply intelligent conservation to the Bay we will throw away a major asset, one which has created the uniqueness of the region and has contributed much of the beauty, inherent, recreation and commercial value that the county possesses. This is a widely-accepted proposition, but there is much confusion and difference of opinion as to what "conservation" of the Bay means. This is a common problem, since instead of being a single, simple concept, conservation is a badly understood and extremely complex idea. The confusion about its meaning is so great and the arguments arising from its use are so acrimonious that some people even suggest that we discard the term. This is not possible since the word is too deeply imbedded in our vocabulary. The confusion about conservation is not because the term is not useful; it is because most people do not realize that there are many legitimate kinds of conservation instead of only one, and that these kinds are often in direct conflict. One man's conservation meat may be another man's conservation poison, and the difficult job of the public official is not only to practice conservation, but first to decide which kind of conservation serves the community best.

Biscayne Bay is an example of one of the most complex regions of the whole world - a shallow sub-tropical estuary - a shallow area where sea and rivers meet, protected by barrier islands, and inhabited by a very large number of species of plants, invertebrate animals, fishes, and other vertebrates. Sub-tropical estuaries like this are among the most productive regions of the world, terrestrial or aquatic - but they are also some of the most delicately balanced ecologically. Alterations in the environment produced by covering the shoreline, by dredging the bottom, by polluting the water, by allowing or diverting the currents, or by changing the ecology in dozens of other ways can result in a whole series of changes that may knock over desirable characteristics of the Bay like a row of dominoes.

We must nevertheless face the fact that use of the Bay by man inevitably forces changes in the Bay. If these changes are not controlled they will damage it permanently, since most of the changes are irreversible. The task facing the people of Dade County is to decide what it wants Biscayne Bay to be and then how they are willing to compromise this ideal, realizing the inevitability of some of the changes that accompany crowding of people on its shores. Only with planning can they direct and minimize the effect of these changes.

As a preliminary to these decisions, the public must learn the kinds of choices it has, and this involves a realization of the kinds of conservation that exist

- many of which are in head to head conflict. Another necessary preliminary is to realize that conservation of natural resources is for the use and benefit and enjoyment of man, and for no other purpose. We do not conserve forests, or birds, or fishes, or any other natural resource for the sake of the trees or the animals, but only for the enjoyment or nourishment of man. If we realize this the task becomes a little simpler and the alternatives a little clearer.

Among the kinds of conservation there is first the conservation of non-renewable resources. Mineral deposits are examples of these. Conservation here means judicious exploitation of the mineral at such a rate that it can be absorbed by the market, and with such devices that a minimum of waste of the resource is suffered. Conservation here also means exploitation in a way which does not destroy the countryside - the forests, streams and soil - while the mineral is being taken.

Space - living space and space for recreation - is another nonrenewable resource. In a sense it is the most precious one we have, and yet most people would not even list it among our resources. But once it is used it can rarely, if ever, be recovered. In our present problem, the conservation of Biscayne Bay, the guarding of space is one of the most important concerns. We must not allow the Bay either to be gobbled up in great gulps or nibbled away in small pieces; either way it is lost, and will never again be available.

There are, next, some semi-renewable resources, whose conservation must be handled differently. Water is the best example of this category. The quality of the water of Biscayne Bay is critical to the whole value of the area: polluted water kills the plants and animals and fouls the bottom; and it spoils the beauty of the Bay and its recreational potential - swimming, boating, fishing. The quality of the Bay water can sometimes be restored if it is spoiled, but this is only a partial and a very slow process. We have had enough intelligence already to restore Bay water quality to some degree in the northern areas of Biscayne Bay, but it is disturbing even here to note how slowly and incompletely the restoration has taken place. The bad side effects of polluted water - anaerobic bottom deposits, reduced populations of desirable invertebrates and fishes - are difficult and slow to restore.

Fresh water is an extremely important part of the natural resources of Biscayne Bay. It makes the water brackish, and this lowered salinity, plus the nutrients carried into the Bay by fresh water runoff from the land, are major contributors to the high fertility of the region. We must design a system of conservation for the fresh water flowing into Biscayne Bay as part of the overall conservation plan. Perhaps we can involve re-use of water after purification if we first learn enough about the likely side effects of sewage processing.

The most complicated kinds of conservation are those involving renewable resources. But these are at the same time the most satisfying, since with skill and determination we have forever the use of resources supplying recreation, food and aesthetic values.

One kind of renewable natural resource is that supplying recreation in terms of display. Few places in the world have more beautiful or spectacular birds than south Florida. The conservation of the shore birds and other varieties should involve (and now does, after violent dispute) their total protection, without any exploitation for commerce whatsoever. Manatees, alligators and some other animals should continue to be totally protected, and their conservation should involve maintenance of the populations at the highest possible level. Display is the profit to be gained from these resources, and display is best served at

high population levels, since the chance of people seeing the animal increases in proportion to the numbers of the latter.

Some plants of Biscayne Bay, including the mangroves, serve valuable ecological purposes, including the production of rich substrate, supporting and sheltering invertebrate populations, and the stabilization of shorelines. But apart from these, the mangroves are worth total protection for their beauty.

Other animal and plant populations deserve total protection. Compared with the birds, it is less obvious why we should protect the worms which live in the Bay bottom, or the sea urchins, the sponges, the sea fans, the copepods, the arrow worms and scores of other lowly animals in the Bay. But many of these are beautiful or interesting in themselves, and many » re supply food or shelter to the fishes and the birds where worth is » re obvious. These animals, and the plants they support, are the nutrient base of all life in the Bay: if there are no plants, there can be no copepods, no worms, no fish or birds. Total protection is the kind of conservation required here.

With some of the larger invertebrates and some of the fishes we come to a different kind of conservation. For fishes, total protection is impossible, and conservation involves some exploitation. For sport fishing, the populations should be kept at the highest possible level in order that fishing success is at a maximum. The conflict here is that as human population (and following it, fishing pressure) increases, fish populations are inevitably reduced, and even if total catches are as high or higher than formerly, success is spread so thinly that individuals cry "depletion". This kind of false "depletion" occurs - and is loudly proclaimed and condemned as soon as any fishing is started. Conservation here involves regulations which strike a balance between reasonable individual fishing success and the maintenance of reproducing populations. This is not easy, but with skill it can be attained.

A different concept of conservation is involved with commercially exploited stocks. Here, the maximum population size and the maximum catch per unit of effort fishing effort are not necessarily beat. Instead, the maximum sustainable yield is to be sought, meaning that the <u>greatest catch</u> is to be encouraged compatible with maintenance of the populations at a satisfactory reproducing size. Hence, fishing efficiency is to be sought, with the best instruments available being employed to catch the fish quickly and cheaply. These fish are not to be subjected so too much exploitation that their populations are reduced below the level where the maximum amount of catch can be made, but as much fishing should be allowed to come exactly to the balance point between increase of the population through additions of young and growth of the individuals and reductions in the population through death and predation - including that of man through fishing. With this concept of conservation of commercial fish stocks there is, of course, the danger of overfishing - so much fishing effort that reductions in the stock are greater than additions. But there is also the idea of <u>under-fishing</u>, where too few fish are caught to make for use of the potential of the population, and some fish are allowed to die unused by man.

But if a simplification is offered here, there are enough complexities in the problem to pose grave difficulties. Among these are the fact that not only do development of a living area and simple increase in the number of inhabitants clash with conservation of the resources of the region, but different kinds of conservation are in direct conflict. One of the most obvious of these conflicts is between sport fishing and commercial fishing, Where the same species is sought by both groups and where fishing pressure is heavy, competition can become acrimonious. This is because neither group may get as many fish as it

wants and because proper conservation of sport fish stocks is different from proper conservation of commercial fish stocks, as pointed out earlier. A clear policy by the County is required before this problem can be approached intelligently.

One policy would be to prohibit commercial fishing in Biscayne Bay. But such a sweeping and inclusive prohibition would be poor conservation since it would not take into account the fact that some species are of no interest to sport fishermen, and if the fish are not caught they are wanted as far as man is concerned. Another policy would be to prohibit any commercial fishing for species sought also by sport fishermen. This would be short-sighted in many cases, since some stocks are not fully exploited when both groups fish them. A knowledge of the level of exploitation in respect to population size is required here. In cases where the stocks are fully exploited, the policy might favor commercial fishing over sport fishing, or the reverse. Whichever policy is adopted depends on economics as well as biology, and a wise decision can come only after considerable discussion and thought. This kind of policy decision must be made, however, and the sooner it and others are made the sooner will a sound and consistent policy be erected for the conservation of Biscayne Bay.

THE IDEAL BAY

To achieve good conservation for Biscayne Bay, it would make the job easier if an agreement could be reached on a description of the ideal Bay. This description is not necessarily that of the original Bay, since we must be realistic in recognizing that we cannot turn time back, and that the ecology of the Bay has been irreversibly altered. Indeed, good conservation of Biscayne Bay would not be to restore it to its original form, since this would involve no use of its resources - no fishing, no boating, no swimming, no access. Again, the ideal Bay from the viewpoint of one kind of conservation will be different from the ideal of other viewpoints, and these conflicts must be reconciled. Of course, this is the root of all the uncertainty about how to handle the Bay; a clear recognition of the conflicts will make the task of solving them easier.

Water

The water of Biscayne Bay should be unpolluted, either by sewage, chemical, oil or other industrial waste. The regular dumping of pollutants should be prohibited and no chance of accidental pollution (such as damage by barges carrying harmful materials) should be allowed.

We should investigate the feasibility of laws controlling the discharge of waste from pleasure boats and other craft in the Bay. Chemical toilets may be necessary. Sewage pollution from the present and future inhabitants of the shores of southern Biscayne Bay should probably be piped offshore into the ocean.

The pattern of water currents should not be altered. The ecology of the Bay is determined to a major extent by the distribution of nutrients, oxygen and temperature through the interchange of ocean and bay waters, the fresh water outflow from the land. No solid causeway or other structures which would alter this pattern should be permitted in the Bay.

Shore line

The shore line of Biscayne Bay should be altered by dredging and filling only to the minimum extent required to protect existing property or to construct causeways and other access structures which are considered desirable after weighing various use criteria. We are now long past the stage where we regard marshy areas at the edge of land as worthless, to be filled as quickly as possible. We now know that such areas are among the most productive of any on earth, and hasty filling of these usually destroys far more things of value to man than it creates in building lots. The present bulkhead line extends too far into the Bay in many cases. It should be changed to correspond to the mean high water line. Otherwise great damage will be done to the valuable edges of the Bay.

If we wish to conserve south Biscayne Bay for its maximum productivity and aesthetic value we must preserve intact a significant part of the shore and adjacent higher mangrove marsh. Aside from the undisputed value as an area of maximum production of basic nutrient material, the marshes serve to spread and slow down the entrance of fresh-water into the Bay.

Although fresh-water is a necessity in preserving estuarine characteristics and high productivity, it can become a killing pollutant if dumped into the Bay in large shots as is now the case with drainage canals at flood time. Although the existing canals probably are permanent features, new canal outfalls should be planned in conjunction with inland salt control levee lines (see the accompanying figure) [NO FIGURE WAS FOUND IN THE COPY OF THE DOCUMENT STORED AT THE UNIVERSITY OF MIAMI.] so that the canals empty water into the marsh behind the coastal mangroves, and this spreads over the marsh and then enters the Bay in a sheet flow.

Productivity

If we fail to conserve the basic productivity of Biscayne Bay, all other efforts of Bay conservation are futile. We must preserve the areas which produce the basic nutrients, and maintain the mechanism whereby these nutrients are re-cycled and distributed to the animals.

The zone of productivity includes the salt and brackish marshes and the shallow grass beds of the Bay. Here great quantities of organic material are produced and reduced annually. It is one of the peculiarities of marshes that they contain relatively few species of animals, but some species exist in enormous numbers. These species are able to live in a rapidly fluctuating habitat, where they break down the raw plant material, pass it out into the marsh mod and water, and make plant material suitable for passing into solution.

The next step in the nutrient chain comes with the rainy season, when the fresh-water runoff passes over the marsh, picks up the yearly accumulation of nutrients and moves it bayward. As the fresh-water mixes with saltwater, the particles of organic material are flocculated or precipitated onto the bottom where they form a soup of rich food upon which the grazing animals feed. The process of flocculation and the action of onshore winds and waves keep this food in the bays, particularly along the shore of the mainland. The beds of accumulated organics also encourage certain seagrasses which, in turn, tend to stabilize the bottom, add to the nutrient bank, and provide dense shelter for small fishes and crustaceans. These small animals are mainly the juvenile stage of species the fisherman pursues, such as barracuda, mangrove snapper, lane snapper, spotted seatrout, ladyfish, bonefish, tarpon, snook, pink shrimp, spiny lobsters, stone crabs and others. These grow rapidly on smaller grazing species, but eventually reach a size sufficient to enter deeper water and the anglers catch.

Some of the organic material is available for transport by bay currents and this feeds the plankton which in turn nourishes fishes of the open bay. Other particles of food move seaward and nourish the corals and other marine life of the reefs. The construction of causeways and the filling of tidal channels can seriously disrupt the patterns of currents and hence the food distribution patterns. Isolation and filling of marshes reduces the animal and plant carrying capacity of bays in direct proportion to the size of the areas filled. Canalization of fresh water directly into the bay prevents the normal pick-up of nutrients by sheetflow across the marshes and can kill the grass beds along the shore by drastic reduction in salinity.

Sport fish populations should be kept at the maximum possible while still allowing reasonable catches to individuals. Obviously these are vague terms, encompassing a wide range of population sizes and perhaps an even wider range of fishermen's appetites. But if some machinery can be constructed for measuring harvest and fishing effort, and some agreement can be reached about allowable total catches for some of the major game fish species, a long step will have been taken toward this aspect of the Bay's conservation. Eventually - perhaps soon for some popular species, later for others - some kinds of more stringent restrictive regulations will he necessary. But until regulations are required it will be false conservation to impose them.

Commercial fish populations (including invertebrates of commercial importance like shrimp) should be exploited at their maximum sustained yields. There is little commercial fishing in the Bay, and this mostly at a low level of exploitation. There is a valuable bait shrimp fishery, to supply the sport fishermen. It has been the subject of controversy many times, It is the opinion of most professional conservationists that this fishery, properly controlled, is not operating contrary to good conservation. It exploits a resource not otherwise used by man, with gear not harmful to the environment. The commercial fishery for lobsters is sizeable, and should be encouraged up to the maximum sustained yield. Some conflict exists between this fishery and a sport fishery for lobsters, and eventually a policy will have to be established to reconcile conflicts as fishing pressure increases on both sides. A small commercial fishery for stone crabs poses no special problem now. A very small mullet fishery could be greatly expanded without harm, if markets existed. On occasion, some Spanish mackerel are caught in the Bay. Conflict arises here since this is a favorite game fish. Policy decisions must be made here too.

Dade County has now the opportunity to make some significant policy decisions for the protection of one of its most valuable resources - Biscayne Bay. It will not have this opportunity much longer, since destructive processes are under way and others threaten even worse changes. The leaders of the community have the responsibility to examine the alternatives and to offer these as clear choices to the inhabitants of the region. In none of the activities of Dade County is planning so vital.